F I G. 1

F I G. 2

INPUT LEVEL (—)	OUTPUT VOLTAGE (V)
0000000000 (0)	V_0
0000000001 (1)	V_1
0000000010 (2)	V_2
⋮	⋮
1111111111 (1023)	V_{1023}

F I G. 3

```
                    ┌─────────────┐
                    │    START    │
                    └─────────────┘
                           │
                                                              S1
   ┌───────────────────────────────────────────────────┐
   │    LIGHT  TRANSMITTANCE  OF  LIQUID                │
   │    CRYSTAL  MATERIAL:MAXIMUM                       │
   └───────────────────────────────────────────────────┘
                           │
                                                              S2
   ┌───────────────────────────────────────────────────┐
   │  BRIGHTNESS:MAXIMUM                                │
   │  OBTAIN  LUMINANCE  L_MH  AND  OUTPUT  VALUE  AD_H │
   └───────────────────────────────────────────────────┘
                           │
                                                              S3
   ┌───────────────────────────────────────────────────┐
   │  BRIGHTNESS:MINIMUM                                │
   │  OBTAIN  LUMINANCE  L_ML  AND  OUTPUT  VALUE  AD_L │
   └───────────────────────────────────────────────────┘
                           │
                                                              S4
   ┌───────────────────────────────────────────────────┐
   │    STORE  LUMINANCES  L_MH,  L_ML  AND  OUTPUT     │
   │    VALUES  AD_H,  AD_L  INTO  STORAGE  UNIT        │
   └───────────────────────────────────────────────────┘
                           │
                                                              S5
   ┌───────────────────────────────────────────────────┐
   │    OBTAIN  LUMINANCE  L_0, L_1,···, L_1023         │
   │      IN  EACH  INPUT  LEVEL                        │
   └───────────────────────────────────────────────────┘
                           │
                                                              S6
   ┌───────────────────────────────────────────────────┐
   │  STORE  NORMALIZED  LUMINANCE                      │
   │                                                    │
   └───────────────────────────────────────────────────┘
                           │
                    ┌─────────────┐
                    │     END     │
                    └─────────────┘
```

S6 box content:

STORE NORMALIZED LUMINANCE

$$\frac{L_0}{L_{1023}}, \frac{L_1}{L_{1023}}, \cdots, \frac{L_{1023}}{L_{1023}} \quad \text{INTO STORAGE UNIT}$$

F I G. 4

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F I G. 5

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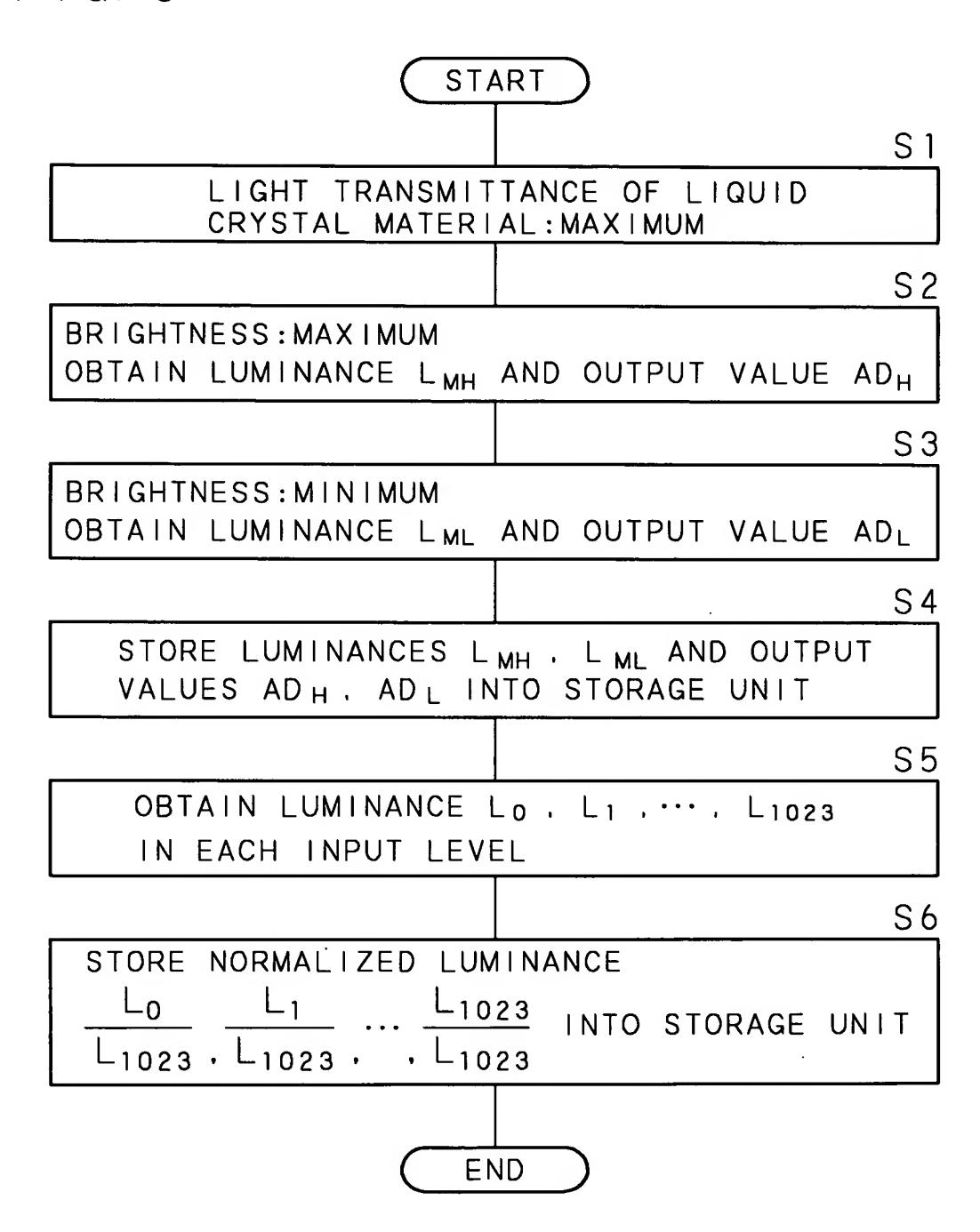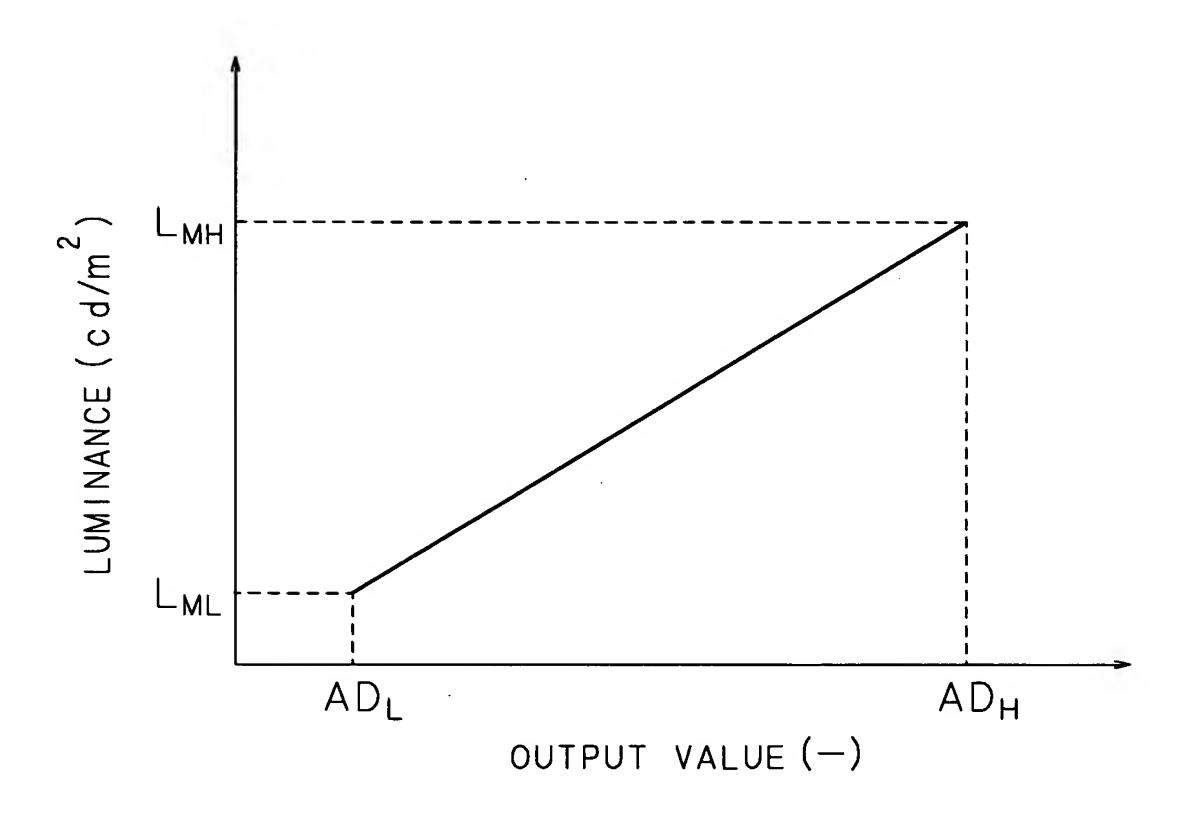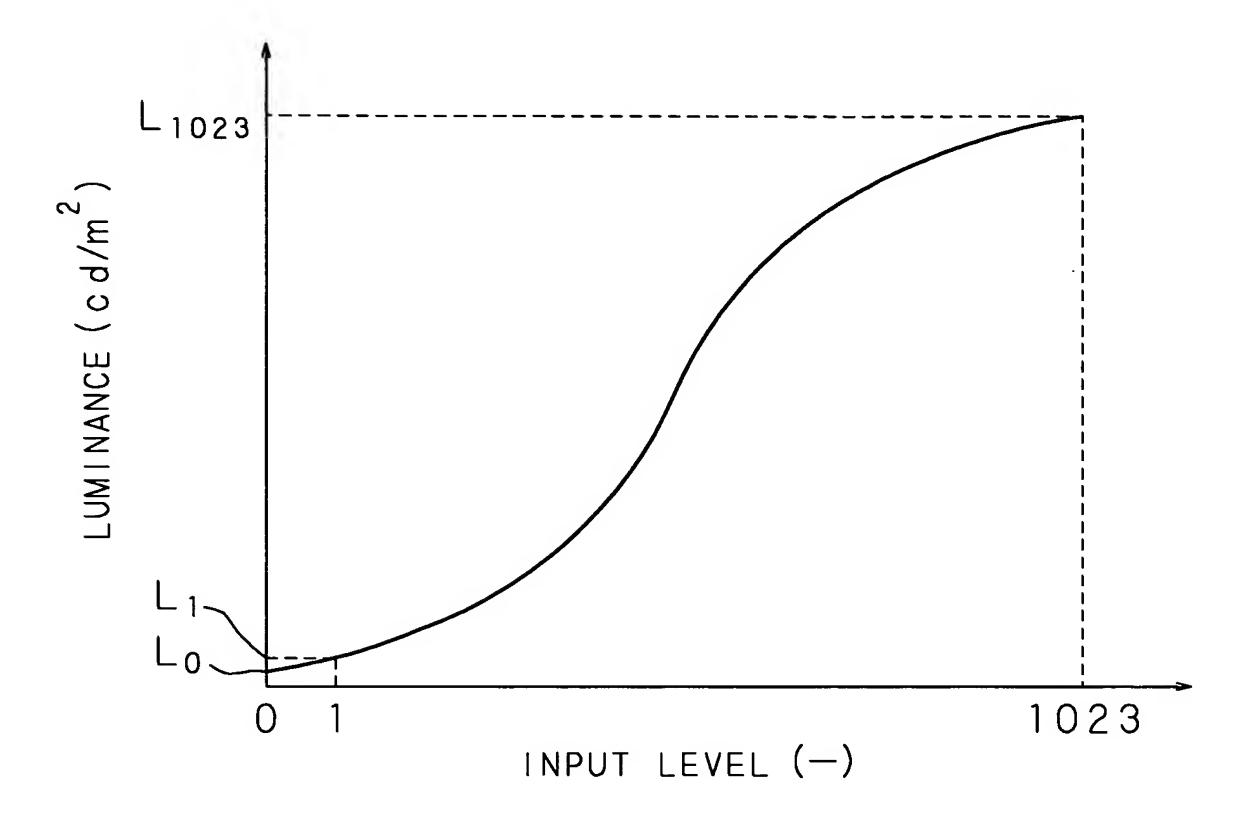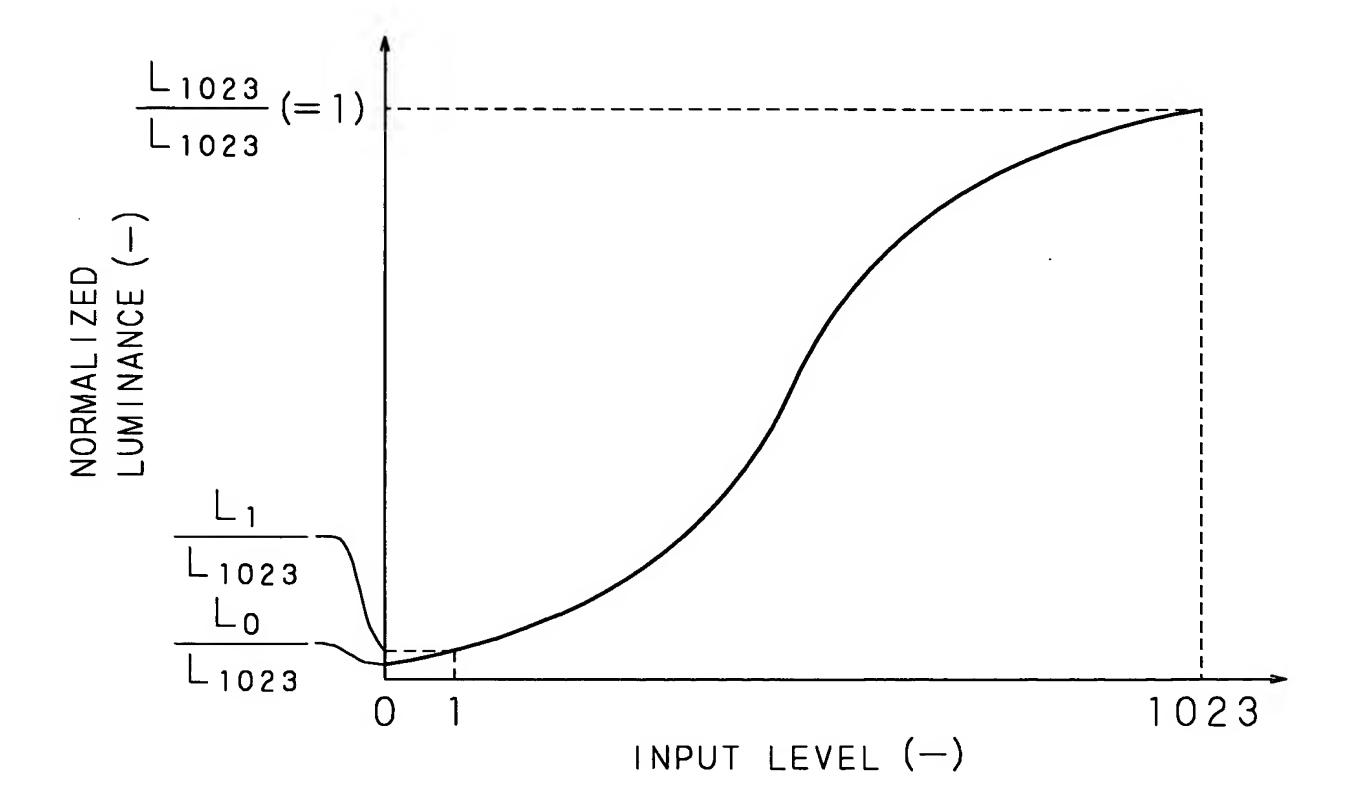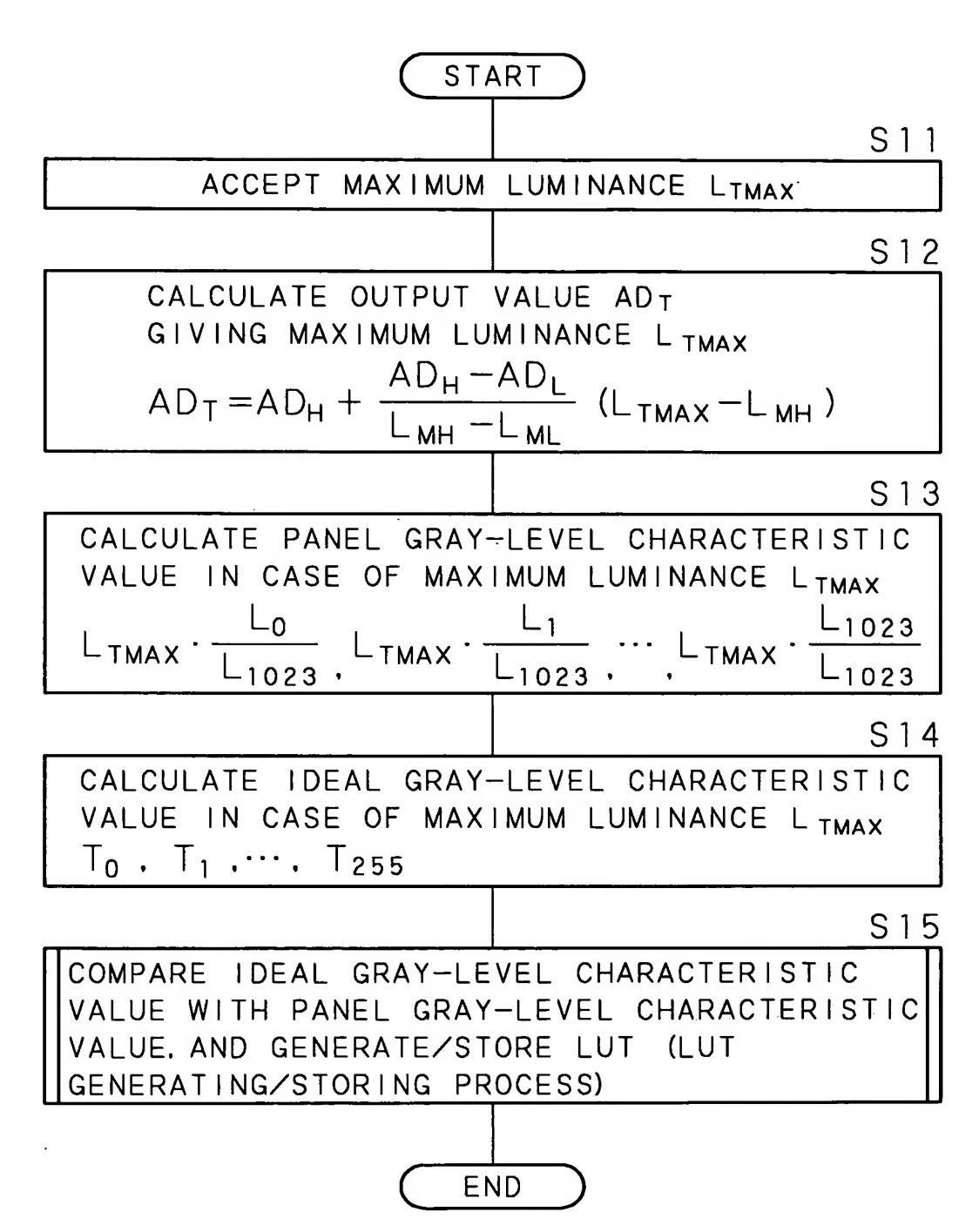Title: LUMINANCE CONTROL METHOD, LIQUID CRYSTAL DISPLAY
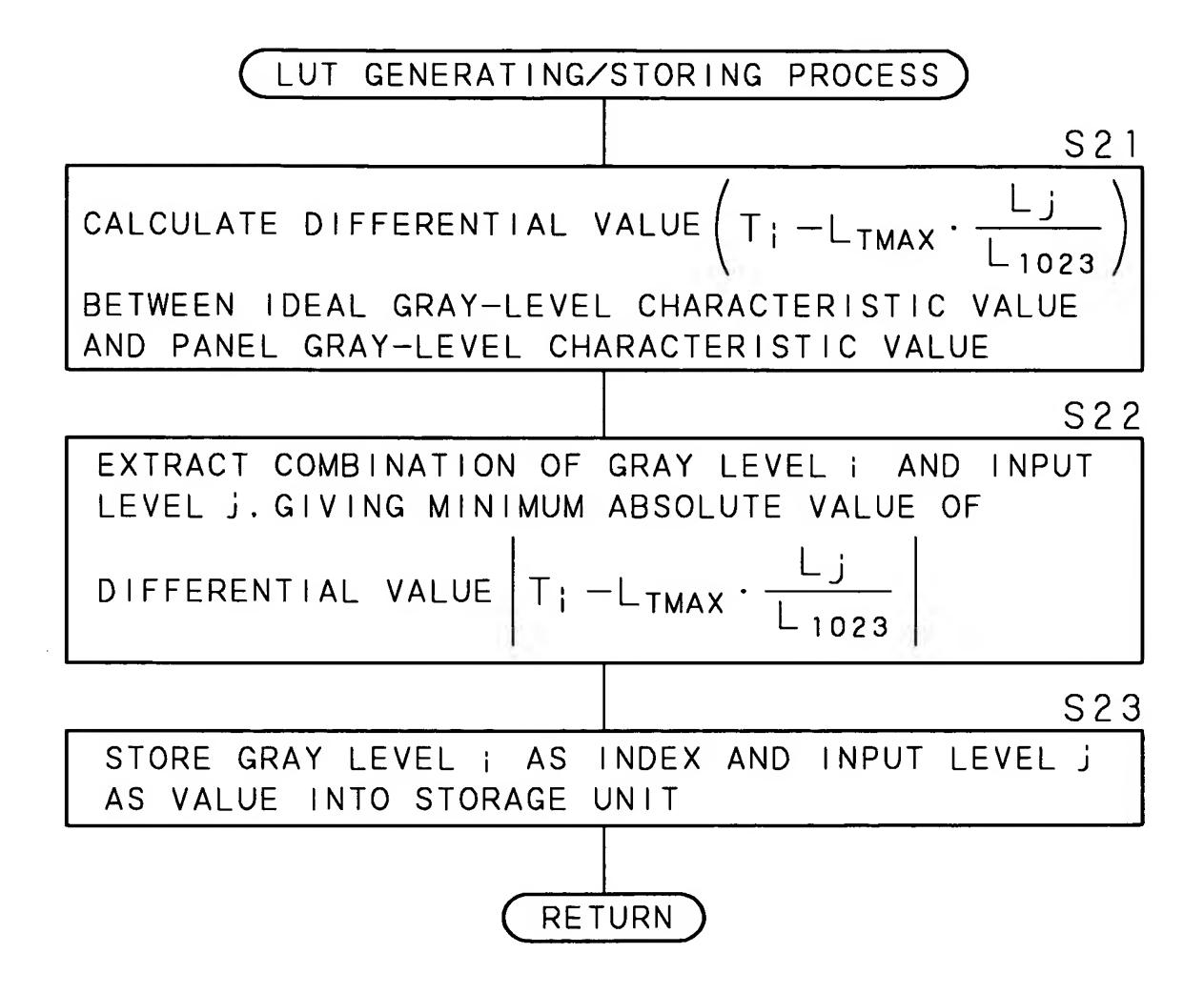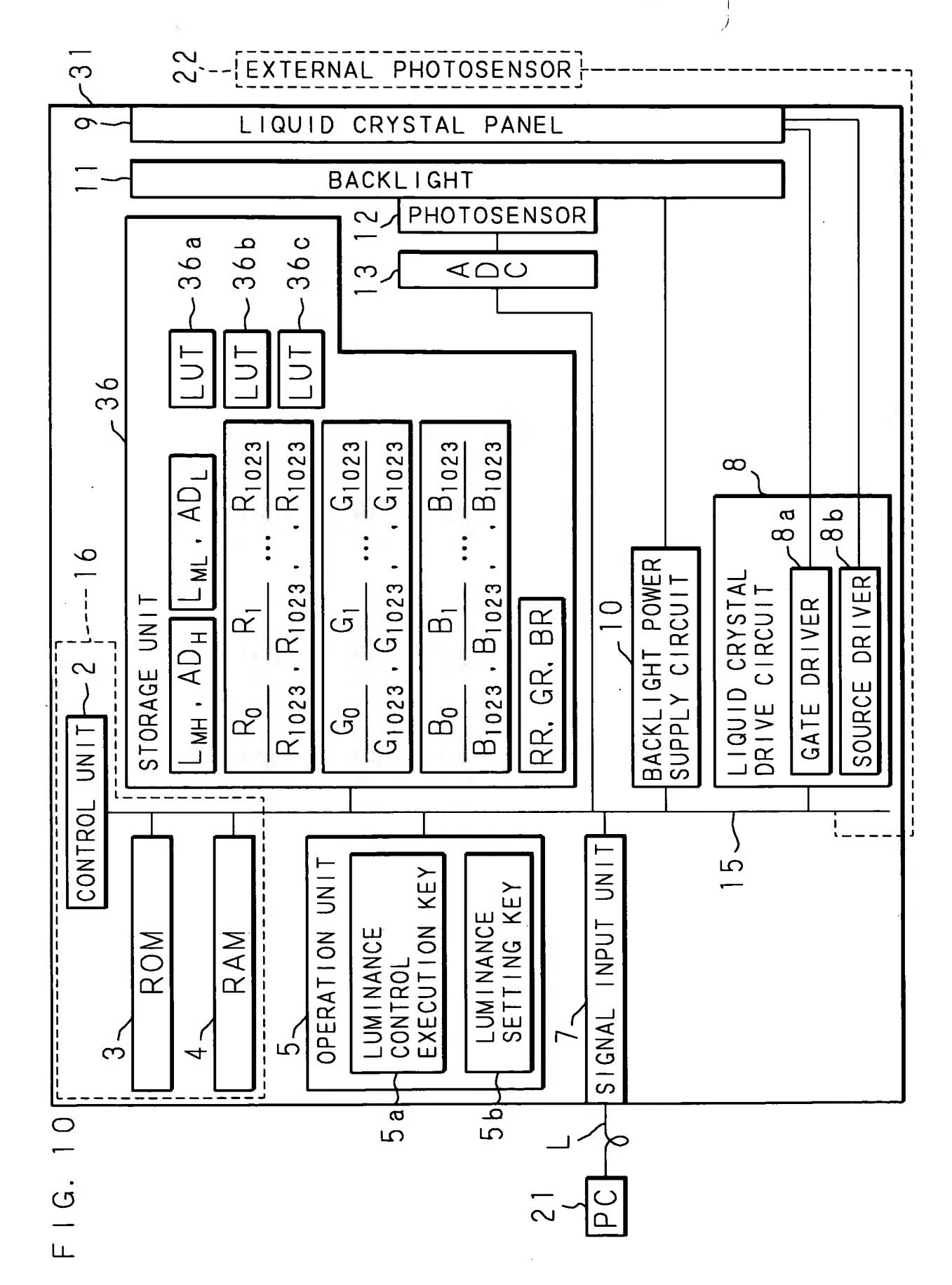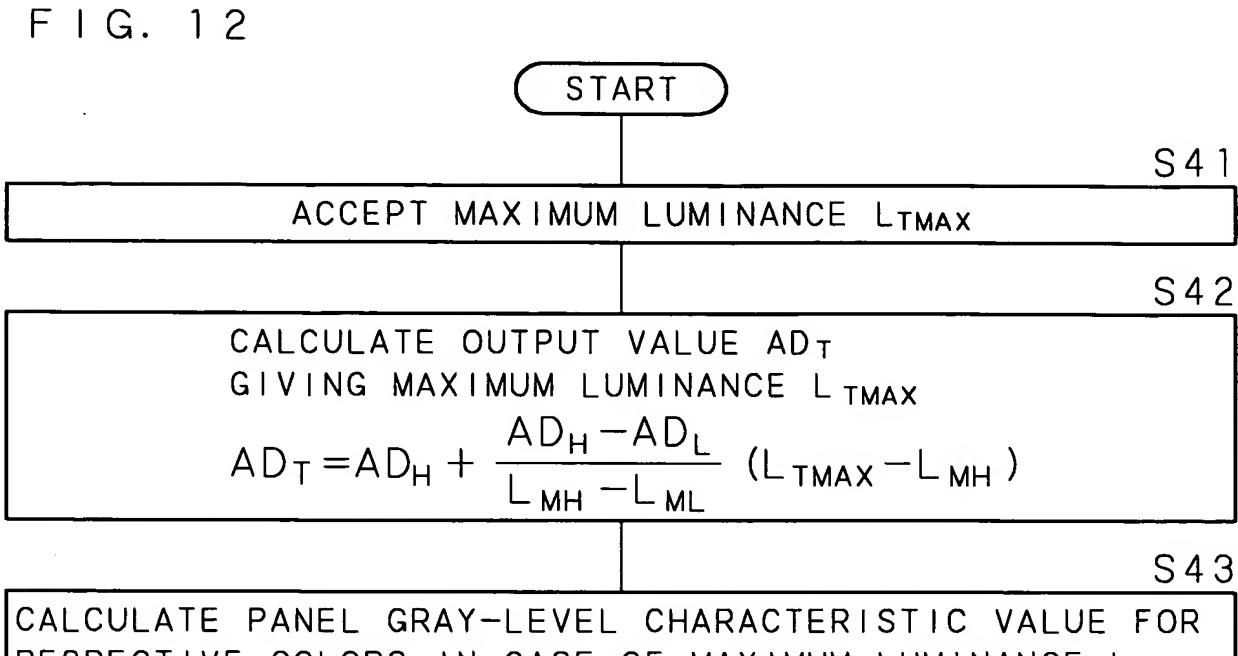DEVICE AND COMPUTER PROGRAM
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F I G. 6

F I G. 7

START

S 1 1

ACCEPT MAXIMUM LUMINANCE L_{TMAX}

S 1 2

CALCULATE OUTPUT VALUE AD_T
GIVING MAXIMUM LUMINANCE L_{TMAX}

$$AD_T = AD_H + \frac{AD_H - AD_L}{L_{MH} - L_{ML}} (L_{TMAX} - L_{MH})$$

S 1 3

CALCULATE PANEL GRAY-LEVEL CHARACTERISTIC
VALUE IN CASE OF MAXIMUM LUMINANCE L_{TMAX}

$$L_{TMAX} \cdot \frac{L_0}{L_{1023}}, \quad L_{TMAX} \cdot \frac{L_1}{L_{1023}}, \quad \cdots \quad L_{TMAX} \cdot \frac{L_{1023}}{L_{1023}}$$

S 1 4

CALCULATE IDEAL GRAY-LEVEL CHARACTERISTIC
VALUE IN CASE OF MAXIMUM LUMINANCE L_{TMAX}
$T_0, T_1, \cdots, T_{255}$

S 1 5

COMPARE IDEAL GRAY-LEVEL CHARACTERISTIC
VALUE WITH PANEL GRAY-LEVEL CHARACTERISTIC
VALUE, AND GENERATE/STORE LUT (LUT
GENERATING/STORING PROCESS)

END

F I G. 8

LUMINANCE LEVEL (—)	MAXIMUM LUMINANCE L_{TMAX} (cd/m^2)
1	600
2	500
3	400
⋮	⋮

F I G. 9

$$\text{LUT GENERATING/STORING PROCESS}$$

S21

CALCULATE DIFFERENTIAL VALUE $\left(T_i - L_{TMAX} \cdot \dfrac{L_j}{L_{1023}} \right)$

BETWEEN IDEAL GRAY-LEVEL CHARACTERISTIC VALUE
AND PANEL GRAY-LEVEL CHARACTERISTIC VALUE

S22

EXTRACT COMBINATION OF GRAY LEVEL i AND INPUT
LEVEL j. GIVING MINIMUM ABSOLUTE VALUE OF

DIFFERENTIAL VALUE $\left| T_i - L_{TMAX} \cdot \dfrac{L_j}{L_{1023}} \right|$

S23

STORE GRAY LEVEL i AS INDEX AND INPUT LEVEL j
AS VALUE INTO STORAGE UNIT

$$\text{RETURN}$$

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FIG. 10

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F I G. 1 1

START

S31

LIGHT TRANSMITTANCE OF LIQUID
CRYSTAL MATERIAL:MAXIMUM

S32

BRIGHTNESS:MAXIMUM
OBTAIN LUMINANCE L_{MH} AND OUTPUT VALUE AD_H

S33

BRIGHTNESS:MINIMUM
OBTAIN LUMINANCE L_{ML} AND OUTPUT VALUE AD_L

S34

STORE LUMINANCES L_{MH}, L_{ML} AND OUTPUT
VALUES AD_H, AD_L INTO STORAGE UNIT

S35

OBTAIN FIRST COLOR LUMINANCE R_0, R_1, $\cdots$, R_{1023},
SECOND COLOR LUMINANCE G_0, G_1, $\cdots$, G_{1023},
AND THIRD COLOR LUMINANCE B_0, B_1, $\cdots$, B_{1023}
IN EACH INPUT LEVEL

S36

STORE NORMALIZED FIRST COLOR LUMINANCE

$$\frac{R_0}{R_{1023}}, \frac{R_1}{R_{1023}}, \cdots, \frac{R_{1023}}{R_{1023}},$$

NORMALIZED SECOND COLOR LUMINANCE

$$\frac{G_0}{G_{1023}}, \frac{G_1}{G_{1023}}, \cdots, \frac{G_{1023}}{G_{1023}},$$

AND NORMALIZED THIRD COLOR LUMINANCE

$$\frac{B_0}{B_{1023}}, \frac{B_1}{B_{1023}}, \cdots, \frac{B_{1023}}{B_{1023}}$$

INTO STORAGE UNIT

S37

CALCULATE $\dfrac{R_{1023}}{L_{MH}}$ (RR), $\dfrac{G_{1023}}{L_{MH}}$ (GR), $\dfrac{B_{1023}}{L_{MH}}$ (BR)

AND STORE THEM INTO STORAGE UNIT

END

FIG. 12

$$\boxed{\text{START}}$$

S41

ACCEPT MAXIMUM LUMINANCE L_{TMAX}

S42

CALCULATE OUTPUT VALUE AD_T
GIVING MAXIMUM LUMINANCE L_{TMAX}

$$AD_T = AD_H + \frac{AD_H - AD_L}{L_{MH} - L_{ML}} (L_{TMAX} - L_{MH})$$

S43

CALCULATE PANEL GRAY-LEVEL CHARACTERISTIC VALUE FOR
RESPECTIVE COLORS IN CASE OF MAXIMUM LUMINANCE L_{TMAX}

$$L_{TMAX} \cdot RR \cdot \frac{R_0}{R_{1023}}, \quad L_{TMAX} \cdot RR \cdot \frac{R_1}{R_{1023}}, \quad \cdots \quad L_{TMAX} \cdot RR \cdot \frac{R_{1023}}{R_{1023}}$$

$$L_{TMAX} \cdot GR \cdot \frac{G_0}{G_{1023}}, \quad L_{TMAX} \cdot GR \cdot \frac{G_1}{G_{1023}}, \quad \cdots \quad L_{TMAX} \cdot GR \cdot \frac{G_{1023}}{G_{1023}}$$

$$L_{TMAX} \cdot BR \cdot \frac{B_0}{B_{1023}}, \quad L_{TMAX} \cdot BR \cdot \frac{B_1}{B_{1023}}, \quad \cdots \quad L_{TMAX} \cdot BR \cdot \frac{B_{1023}}{B_{1023}}$$

S44

CALCULATE IDEAL GRAY-LEVEL CHARACTERISTIC
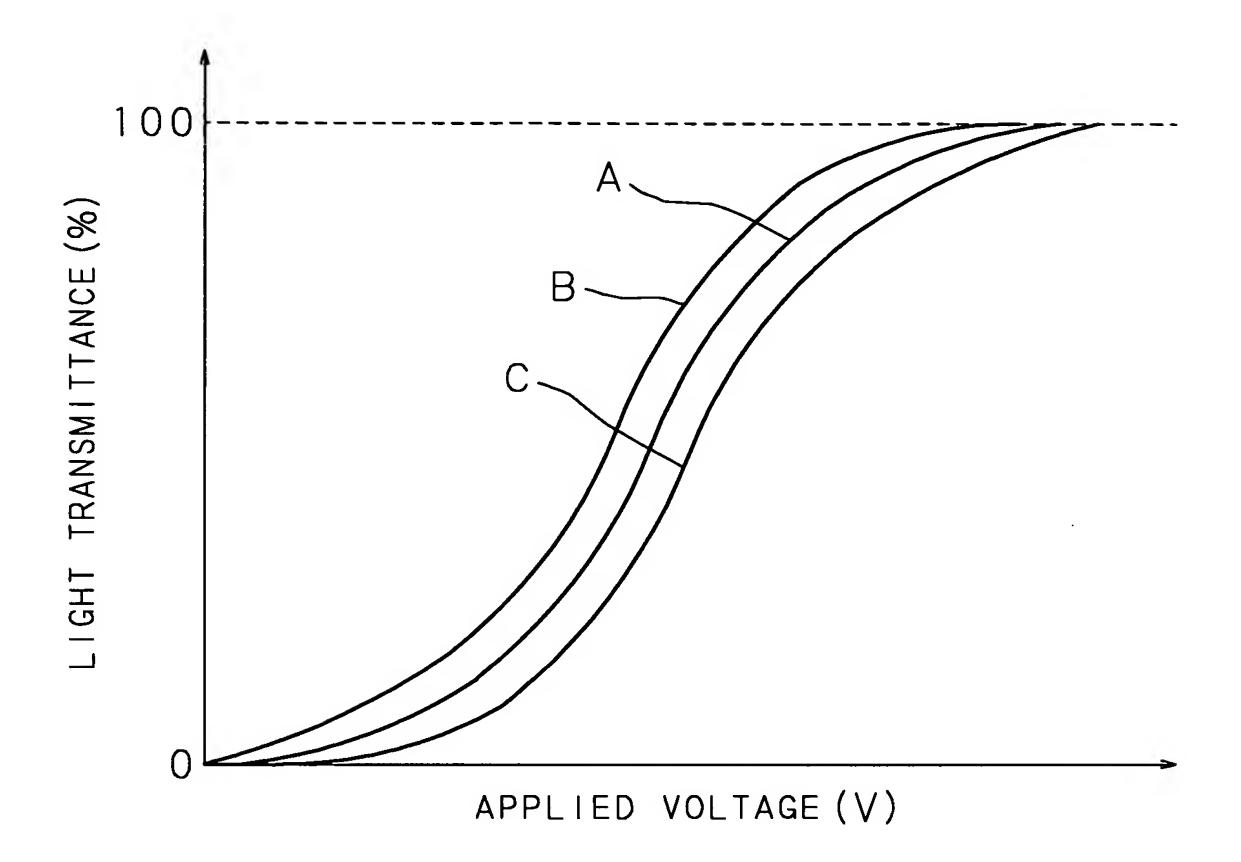VALUE IN CASE OF MAXIMUM LUMINANCE L_{TMAX}
$T_0, T_1, \cdots, T_{255}$

S45

COMPARE IDEAL GRAY-LEVEL CHARACTERISTIC
VALUE WITH PANEL GRAY-LEVEL CHARACTERISTIC
VALUE. AND GENERATE/STORE LUT (LUT
GENERATING/STORING PROCESS)

$$\boxed{\text{END}}$$

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F I G. 1 3

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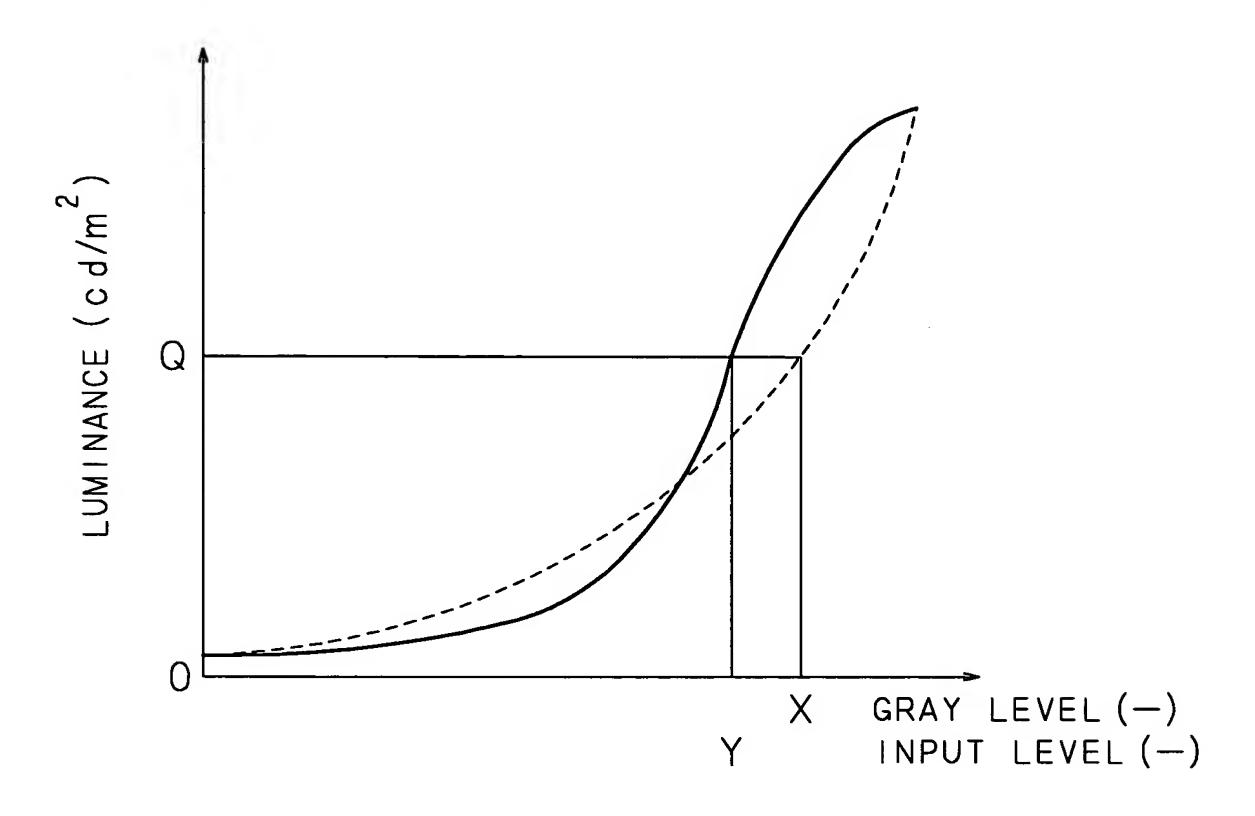   DEVICE AND COMPUTER PROGRAM
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F I G. 1 4

GRAY LEVEL (INDEX)	INPUT LEVEL (VALUE)
00000000 (0)	0000000000 (0)
00000001 (1)	0000000101 (5)
00000010 (2)	0000001000 (8)
00000011 (3)	0000001001 (9)
⋮	⋮
11111111 (255)	1111111111 (1023)

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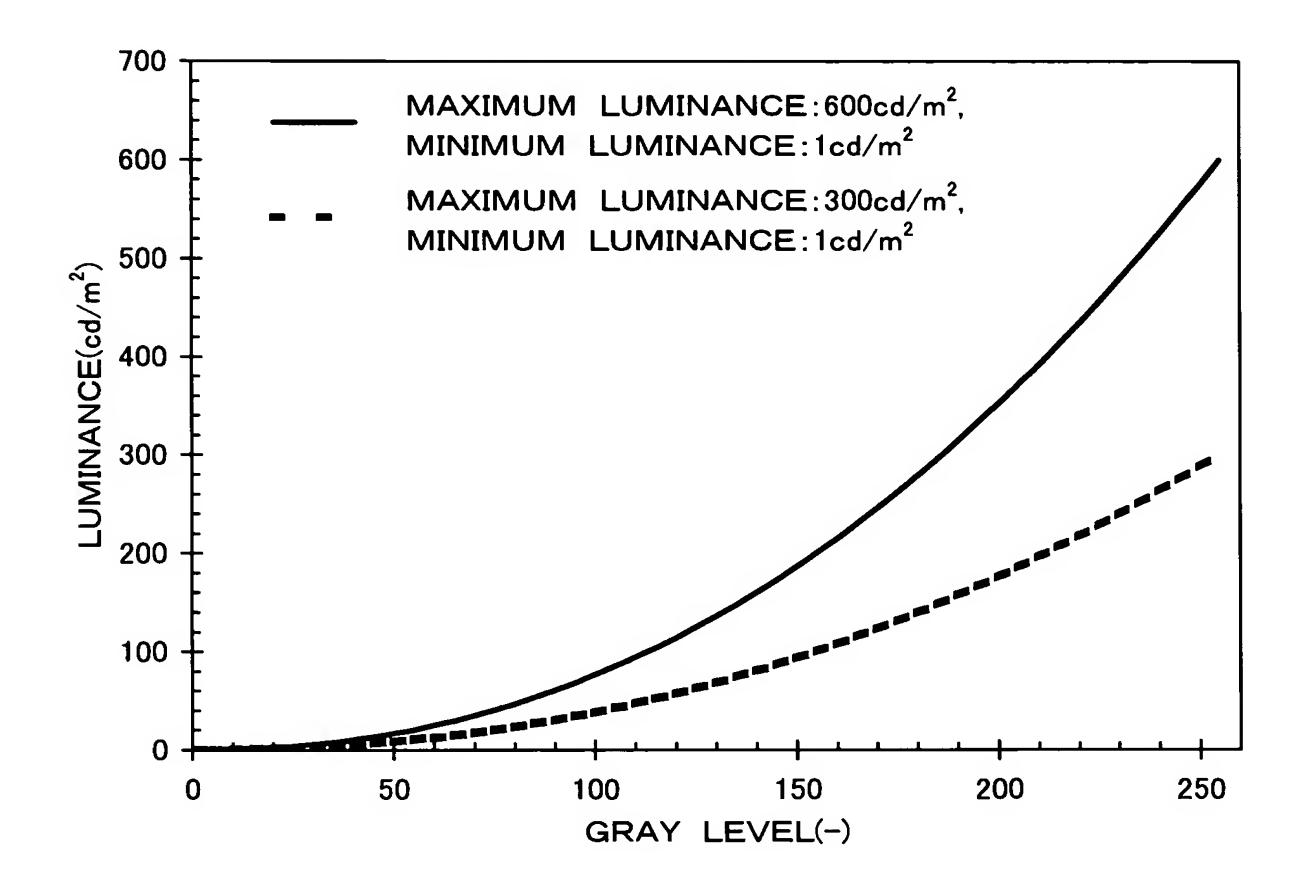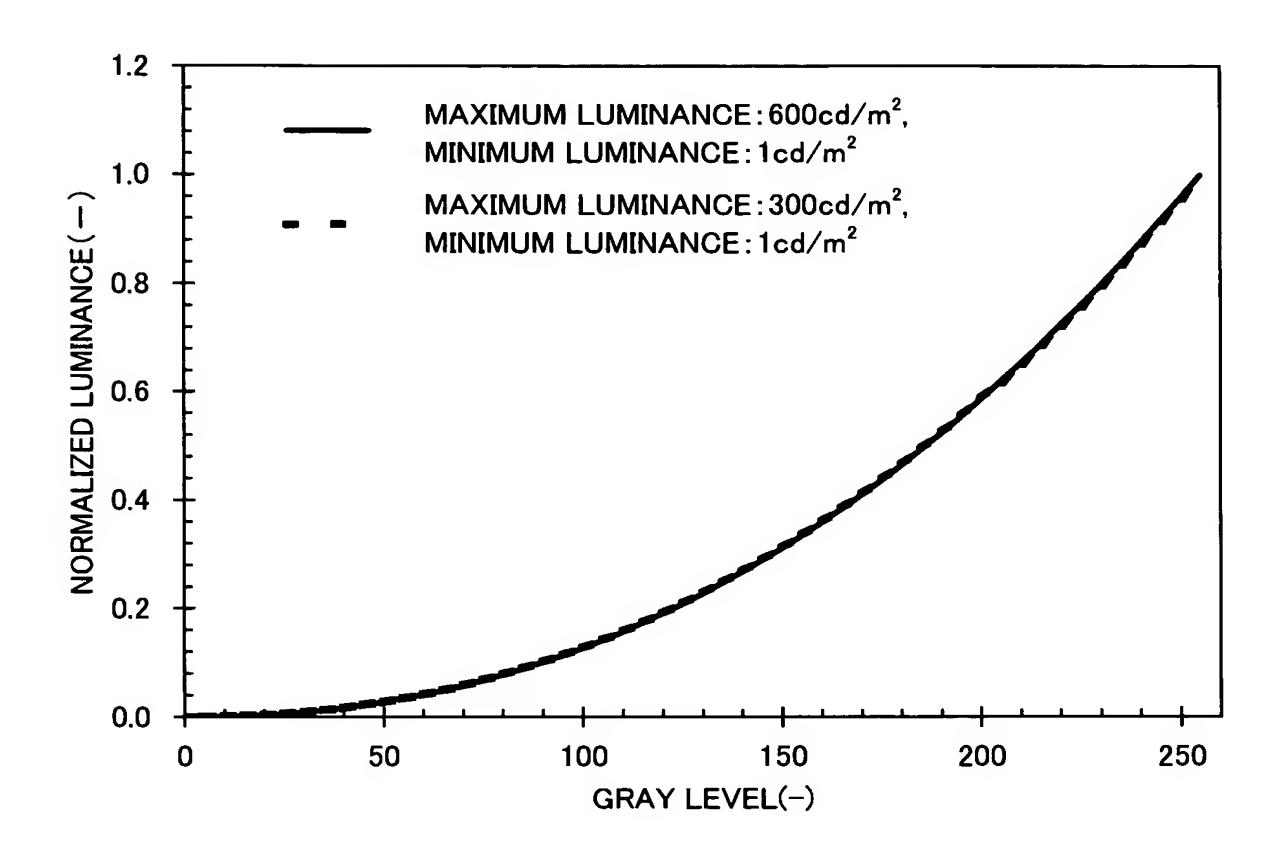NEW SHEET   Sheet 15 of 20

F I G. 1 5

(a)

DATA BEFORE CONVERSION

0	1	2	1
0	2	3	2
0	1	1	1
1	1	0	0

(b)

DATA AFTER CONVERSION

0	5	8	5
0	8	9	8
0	5	5	5
5	5	0	0

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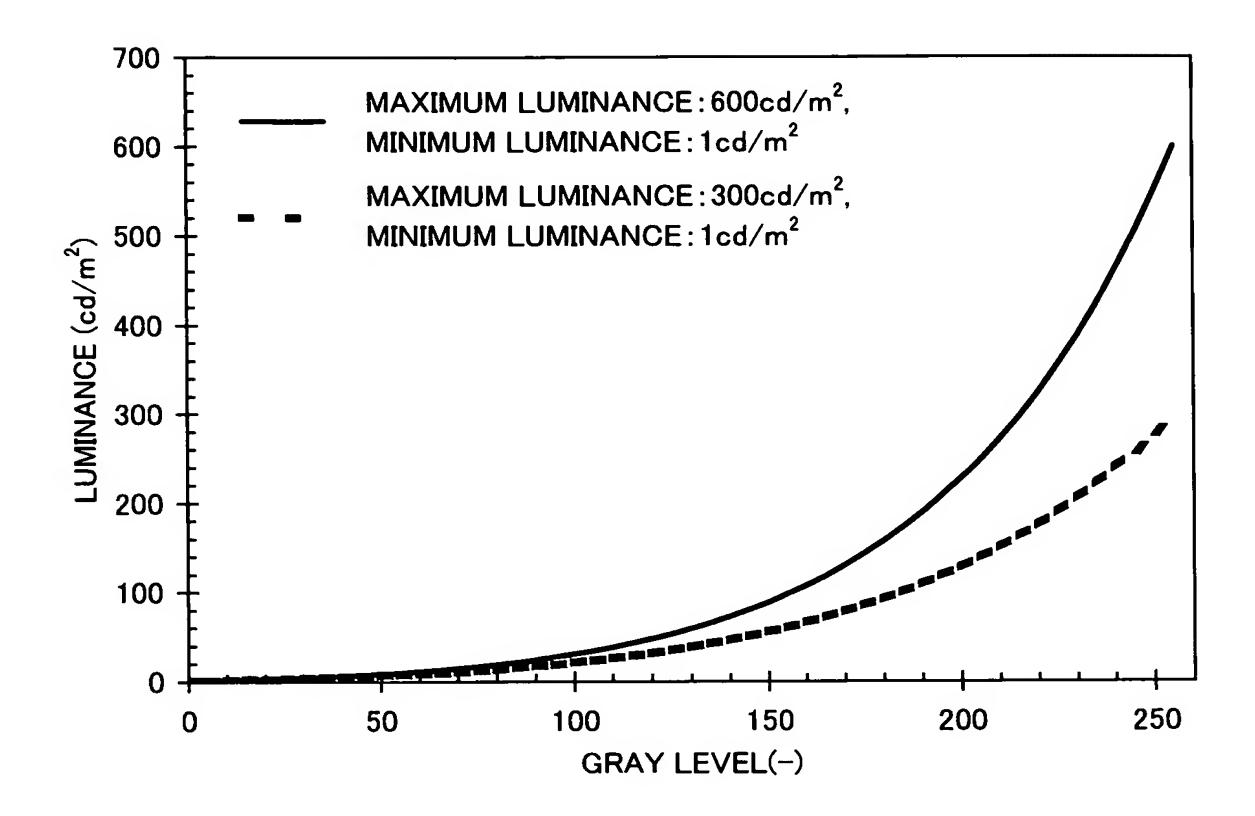
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F I G. 1 6

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FIG. 17

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FIG. 18

FIG. 19

FIG. 20